REMARKS

Claims 22-35, 58 and 60-62 remain pending. Please reconsider the above-referenced application in light of the following remarks.

Claims 22-35, 58 and 60-62 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,739,579 ("Chiang") in view of U.S. Patent No. 6,016,000 ("Moslehi"). The rejection is respectfully traversed.

Applicant respectfully submits that the cited references do *not* disclose or suggest that a "heat-radiating layer is formed *completely on* an upper surface portion of [a] copper conductor," as recited in claim 22 (emphasis added), or a "heat-radiating layer [which] is formed *completely on* an upper surface portion of [a] first conductive plug," as recited in claim 29 (emphasis added), or a "heat-radiating layer [which] is formed *completely on* an upper surface portion of [a] *second* conductive plug," as recited in claim 58 (emphasis added).

The Office Action asserts that "Chiang et al. discloses forming a top etch stop/heat radiating layer (392) wherein said heat-radiating layer is formed completely on an upper surface portion . . . of said copper conductor (394)." (p. 9). In support of this statement, the Office Action cites to Chiang's Col. 21, ll. 4-16. Applicant respectfully disagrees.

Chiang does *not* teach or suggest a heat-radiating layer formed *completely on* an upper surface portion of a copper conductor, a first conductive plug, or a second conductive plug. Chiang's col. 21, ll. 4-16 merely discloses that "[e]tch stop layer 392 is *formed over* dielectric layer 391 and the via plug in dielectric layer 391 including conductive layer 394 and barrier layer 393." (Col 21, ll. 6-8) (emphasis added). The fact that Chiang's etch stop layer 392 is formed *over* dielectric layer 391 is *not* the same as

forming a heat-radiating layer *completely on* an upper surface portion *of a copper conductor*, a conductive plug, or a second conductive plug This fact is underscored by reference to Chiang's FIG. 25 (reproduced below).

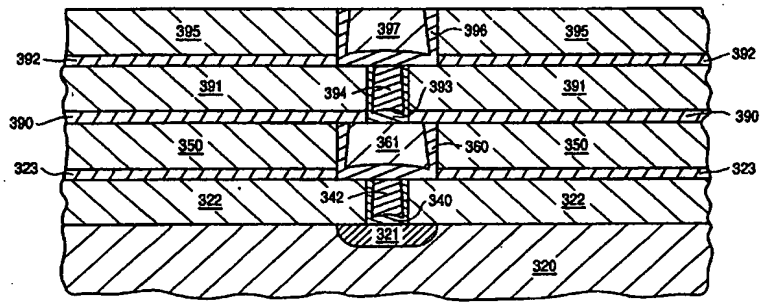

FIG. 25

Chiang's col. 21, ll. 4-16 describes the embodiment illustrated in FIG. 25 (Col. 4, ll. 4-5). In Chiang's FIG. 25 (illustrated above), the etch stop layer 392, which the Office Action asserts corresponds to Applicant's claimed heat-radiating layer, is *not* formed *completely on* conductive layer 394. In fact, etch stop layer 392 is *not* even formed *completely* on *or* over conductive layer 394. Barrier layer 396 is formed completely on or over conductive layer 394. Similarly, FIG. 25 illustrates that etch stop layer 390 is *not* formed *completely* on *or* over conductive plug 361 and etch stop layer 232 is *not* formed on *or* over conductive plug 342. In this case, barrier layer 393 is formed completely on or over conductive plug 361. None of the etch stop layers in Chiang are formed *completely on* a conductive plug.

In stark contrast, Applicant's claimed invention provides a heat-radiating layer 60 provided *completely on* a copper conductor or conductive plug 56. As illustrated, for example, in an exemplary embodiment shown in FIG. 9 which is reproduced below. The heat-radiating layer 60 is completely on conductive layer 56.

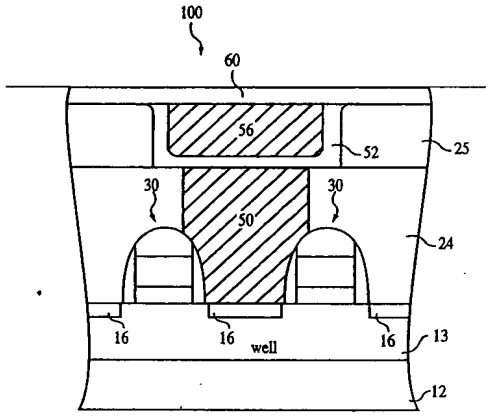

FIG. 9

Similarly, in the exemplary embodiment of FIG. 10 (reproduced below), a heat-radiating layer 60a is provided *completely on* a second conductive plug 56a.

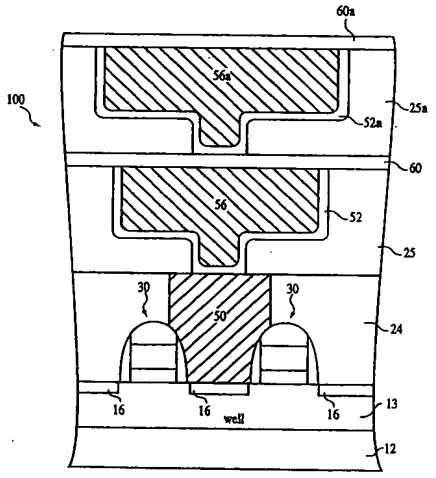

FIG. 10

Moslehi is relied upon for disclosing a method of forming an etch stop/heat-radiating passivation layer comprising aluminum nitride, and adds nothing to rectify the deficiencies of Chiang. The Office Action asserts that it would have been obvious to substitute Moslehi's aluminum nitride passivation layer for Chiang's silicon nitride etch-stop layer, since Moslehi discloses AlN is an alternative choice.

It is infeasible, however, to use Moslehi's AlN passivation layer in Chiang since Chiang discloses that SiON and PSG are preferred when a copper conductor is present. Chiang teaches away from using other materials. For example, Chiang discloses that a "passivation layer may be formed over an uppermost interconnect layer . . . [and] may include . . . silicon oxynitride (SiON) or phosphosilicate glass (PSG)." (Col. 21, lines 38-42). Chiang also discloses that where "copper (Cu) is used for the uppermost interconnects and exposed at [an] interconnect layer, a silicon oxynitride passivation layer may be used." (Col. 21, lines 45-48). Chiang does *not* disclose or suggest using AlN for the passivation layer, but instead uses SiON when copper is employed.

There is also no motivation to substitute Moslehi's AlN passivation layer for Chiang's etch-stop layers. Chiang discloses the use of a passivation layer. As discussed above, the only feasible layer in which AlN would be used is over the uppermost interconnect in Chiang's structure.

Further, Chiang discloses that etch-stop layers 323, 390, and 392 *should* consist of silicon nitride. The benefit of using silicon nitride, in Chiang, is that "[s]ilicon nitride is a diffusion barrier to copper," (Col. 2, lines 55-58). Chiang discloses that in the prior art, "interconnects should not lie on a silicon nitride layer because it has a high dielectric constant compared to silicon dioxide." (Col. 2, lines 58-61). Consequently, Chiang's structure and methods *allow* a copper interconnect to be formed on a silicon

nitride layer. The proposed substitution would defeat the very problem that Chiang is directed to solving.

Claim 23-28 depend from claim 22 and should be similarly allowable along with claim 22 for at least the reasons provide above. Claim 30-35 depend from claim 29 and should be similarly allowable along with claim 29 for at least the reasons provided above. Claims 60-62 depend from claim 58 and should be similarly allowable along with claim 58 for at least the reasons provide above.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to review and pass this application to issue.

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Respectfully submitted,

By _____

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